# D1.7 Project Progress Report

**SHOTPROS**

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|---|---|
| Deliverable | D1.7 |
| Deliverable Lead | USECON |
| Related work package | WP1 |
| Author(s) | Markus Murtinger (USE)<br>Gerhard Helletzgruber (USE)<br>Valerie Schlagenhaufen (USE)<br>Birgit Harthum (USE) |
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# Versions

| Vers. | Date | Author | Description |
|---|---|---|---|
| V0.1 | 17.09.2022 | Gerhard Helletzgruber (USE) | First Draft |
| V0.2 | 04.10.2022 | Valerie Schlagenhaufen, Gerhard Helletzgruber (USE) | Content compilation |
| V0.3 | 14.10.2022 | Valerie Schlagenhaufen, Gerhard Helletzgruber, Birgit Harthum (USE) | Integration of partner inputs and review |
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# List of Acronyms and Abbreviations

| Acronym / Abbrevation | |
|---|---|
| AAR | After-action review |
| CM | Consortium meeting |
| DMA-SR | Decision-making and acting in stressful and high-risk situations |
| DoA | Description of the Action |
| FT | Field trial |
| HF | Human factors |
| HMD | Head-mounted displays |

| | |
|---|---|
| HR/HRV | Heart rate / heart rate variability |
| KPI | Key performance indicator |
| LEA | Law Enforcement Agency |
| NPC | Non-Player Character |
| SC | Steering Committee |
| UI | User interface |
| VR | Virtual reality |
| WP | Work package |

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# Executive Summary

This deliverable D1.7 is the second project progress report and covers the following aspects of SHOTPROS within the reporting period from M19-M42:

- **Chapter 1: Project Overview**: brief summary of the project and responsibilities
- **Chapter 2: Project Management**: describes how the project was managed and which measures were taken by the coordinator to ensure successful completion of SHOTPROS
- **Chapter 3: Project Progress Report**: briefly summarises which steps were taken by the consortium of SHOTPROS to achieve the desired goals of the project based on the technical reports from the WP Leaders
- **Chapter 4: Societal Impact Report**: introduction of the assessment of the (expected) societal impacts of the project

The Progress Report shows the main efforts and achievements of the Consortium towards the objectives set forth in the DoA and outlines the different tasks executed in the workpackages in the second period of the project.

The following exemplary progress highlights are indicated here at a glance:

- ✓ Over **20 research studies** conducted to deliver validated scientical and technical results
- ✓ Over **15 scenarios** and 1 scenario guidelines document created, validated and implemented with developed SHOTPROS VR solution
- ✓ **6 field trials** hosted by the LEA partners to test the developed SHOTPROS VR solution and showcase and disseminate it to a broader audience
- ✓ Cumulative number of **over 4000 participants** in the studies and field trials
- ✓ Several **press releases** delivered to national and international media resulting in **45 references** of the project **in the media**
- ✓ Set-up, Kick-off and utilization of the **VR Police Network** with more than **80 official members** from LEAs, research, technology companies and policy-makers
- ✓ More than **130 participants** at the **final conference from 17 different European countries**

# 1  Project Overview

The SHOTPROS project aims to investigate the influence of psychological and contextual human factors (HFs) on the behaviour of decision-making and acting (DMA) of police officers under stress and in high-risk operational situations in order to design better training for police officers to improve DMA Performance. For this purpose SHOTPROS has developed a Virtual Reality (VR) solution to experimentally assess the degree to which these factors influence DMA behaviour.

The project has developed a HF-rooted training curriculum and a corresponding VR training solution to provide a comprehensive framework for practical training for decision-making and acting under stress and in high-risk (DMA-SR) situations in order to improve performance. The training will increase DMA-SR performance which will lead to better and more correct decisions (from several perspectives, e.g. law, ethic, etc.), to keep the guidance in threatening situations, to minimise use of force occurrences, and accordingly, to maximise the avoidance of casualties and collateral damage, such as panic and cascading or escalating effects. The partners complement each other in their research focus, expertise and technologies, which is reflected in the specific tasks they have taken on in their roles.

WPs and Leader

| WP | WP Title | Lead |
|----|----------|------|
| WP1 | Project Management | USE |
| WP2 | Requirements Analysis and User Research | KUL |
| WP3 | Training Concepts & New Innovation Approach | VUA |
| WP4 | Training Experience Assessment, Modelling and Scenario Development | AIT |
| WP5 | Contextual VR Simulator-Toolkit | RL |
| WP6 | Human Factor Studies & Experiments | AIT |
| WP7 | Evaluation Phase with Field-Trials and Generation of Final Results & Impacts | VESTA |
| WP8 | Dissemination, Exploitation & Communication | USE |
| WP9 | Ethics requirements | USE |

*Table 1: Work packages and WP-Lead Partner*

Main contact persons/responsible representatives per partner:

- **Markus Murtinger (USECON):** Markus Murtinger is the Director of Marketing and Sales at USECON. As project coordinator he is responsible for WP1 – Project Management and WP9 – Ethic requirements.
- **Valerie Schlagenhaufen (USECON):** As Marketing and Business Development Manager at USECON, Valerie Schlagenhaufen leads the WP8 – Dissemination, Exploitation & Communication.
- **Helmut Schrom-Feiertag (AIT):** As a researcher at the Austrian Institute of Technology-Center for Technology Experience with a focus on innovations of adaptive virtual reality (VR) training systems, he has taken over the technology and user experience view in the Executive Board (replacing Sebastian Egger-Lampl in the second period).
- **Raoul Oudejans (VUA):** Raoul Oudejans is (Associate) Professor for Learning and Performing in Sports at the Department of Human Movement Sciences, Vrije Universiteit Amsterdam and an expert for training methods as well as perceiving and acting in high-pressure contexts.
- **Emma Jaspaert (KUL):** As a criminologist in the juridical department of the KU Leuven, Emma Jaspaert is responsible for Ethics and Legal aspects in SHOTPROS.
- **Günther Dauwen (VESTA):** Günther Dauwen from Campus Vesta, the Trainings Facility for Emergency Management Training & Education, has a long experience in building and managing European political and academic networks and has taken over the end user management and the lead in setting up the VRPN network in SHOTPROS (replacing Floor Lambs in the second period).
- **Christian Haarmeijer (RL):** Christian Haarmeijer as Managing Director from RE-liON is in close contact with the end users to advise on and define solutions tailored to their VR-training needs and will be involved in all technical SHOTPROS decisions.

## 1.1  Interrelation of WPs

The defined structure of the work packages follows a human-centred research (HCR) approach. HCR is an iterative process focusing on the end users (LEAs) and their needs in each phase of the project process. HCR calls for involving users throughout the process via a variety of research and design techniques to create highly usable and accessible products and services for them and to fulfil the defined objectives.
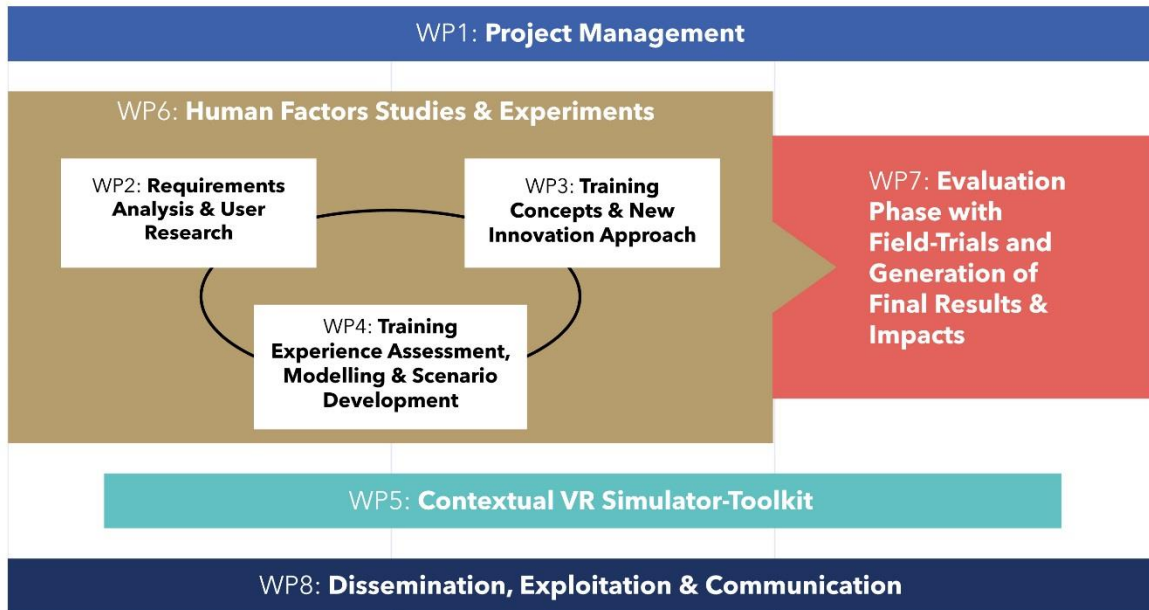
*Figure 1: PERT chart shows interrelation of SHOTPROS WPs*

# 2  Project Management (M19-M42)

## 2.1  Consortium Meetings and SC Meetings

USE has organised bi-annual consortium meetings jointly with the pre-defined host partner. All partners attended with at least one representative of their organisation.

The table provides an overview of the planned and conducted Consortium meetings of the project. The meetings in M19 (together with the EC review meeting) and M25 (in light grey) have been affected by the COVID-19 pandemic and were conducted online. Due to the aggravating covid situation at the end of October 2021 the consortium meeting in Vienna in M31 (in dark grey) was changed to a half-day online conference (instead of a full CM).

|  | **M19** | **M25** | **M31** | **M37** |
|---|---|---|---|---|
| **Location** | **Selm*** | **Amsterdam*** | **Vienna*** | **Berlin** |
| **Partner** | LAFP NRW | VUA | AIT/USE | BP |
| **Date** | Nov 20 | May 21 | Cancelled due to COVID | May 22 |

*Table 2: Consortium Meeting overview*

*CM in M19 and M25 conducted online due to COVID, M31 was cancelled due to COVID (online conference instead by the end of November)

As part of the bi-annual Consortium Meetings USE organised and convened the meetings of the Steering Committee. All partners have nominated a representative and a proxy for their organisation and participated regularly in the meetings, which were additionally combined with the online conferences in M31 and M35. USECON set the agenda and produced the meeting minutes for the 5 SC meetings (see D1.8) held in this period, where topics like the scheduling and location for the review meeting, amendment procedure and budgetary reallocation issues were brought forward, explained, discussed and agreed upon.

## 2.2  Online Conferences

USE has arranged quarterly conferences (either as part of the Consortium Meeting or as separate online meeting in between the bi-annual Consortium Meetings) and provided the presentations and meeting minutes which were sent to the partners and made available at the SHOTPROS SharePoint. A brief overview of the online conferences and the discussed topics is given below.

- **Online Conference M21,** 12th of January 2021
    - Financial & Project Management Status
    - Implications from the Review
    - Procedure for re-opened Deliverables
    - Project Extension

- **Online Conference M22,** 16th of February 2021
    - Adapted project management process
    - Financial & Project Management Status
    - Summary and emphasising of the recommendations and comments of the EC
    - Presentation of SHOTPROS project management tool
    - Demonstration of agile VR development process
    - Deliverables Peer Review Process
    - Enhancements of the End User Management (EUM)

- **Online Conference M27**, 25th of August 2021
    - Status – project coordinator view and outlook
    - Dissemination and communication status and planned activities
    - Financial reporting – overview
    - Status update and reporting from partners

- o   Preparation EC technical review


- **Online Conference M31**, 30th of November 2021
    - o   Coordinator project status
    - o   EC review – follow up
    - o   Project management & deliverables
    - o   Dissemination & exploitation
    - o   Financial reporting – overview
    - o   Status update and reporting from partners


- **Online Conference M35**, 10th of March 2022
    - o   Management overview & project status,
    - o   Dissemination & Exploitation update
    - o   Reporting & Finances
    - o   Progress update and reporting from partners


- **Online Conference M40**, 16th of August 2022
    - o   Project Management Status Update
    - o   Status Deliverables
    - o   Financial Reporting / Reporting Procedures
    - o   Dissemination & Communication Report, Exploitation
    - o   Presentations to Final Conference, VRPN Network status and D7.3
    - o   Presentations to D7.4, D7.5 & D7.6 status and progress


- **Online Conference M42**, 24th of October 2022
    - o   Preparation EC final review


## 2.3  Technical & Financial Management

In the second reporting period a SHOTPROS management tool was set up to adequately reflect the agile planning and methodology used in the project and to enable a more accurate monitoring of the technical progress, efforts and resources needed to complete the tasks set out in the DoA. For this purpose, the excel-based management tool and a user manual with the new functionalities was presented to the partners and was made available on the internal SharePoint to display the status of the overall project to all project participants in real time and thus improve the agile collaboration and coordination between the WP and task leaders, including LEAs and external advisors. This tool has provided an overview of the status of

project deliverables and software releases in terms of time, responsibilities, involvement and use of resources (person-months) in the present, past and future and was updated in regular intervals.

To ensure a continuous project focus and monitoring, USECON has established the following internal technical and financial reporting structures including

- the collection of 3-monthly internal technical progress, effort report with efforts outlook combined with an online meeting where the current status and progress is presented, discussed and the future planning is developed (due by M27, M33 and M39).
- the collection of 6-monthly internal technical and financial progress reports after each internal reporting period (due by M24, M30 and M36) combined with either a full consortium meeting (see D1.8) or an online conference.

The reports contained a summary of the technical work carried out and a short explanation of any deviations (in terms of effort, budget and content) as well as possible risks and potential countermeasures or contingency plans. Furthermore, the involvement of partners was addressed and aspects of dissemination as well as the added value and innovative character of the work were briefly outlined. The consolidated reports have been made available to all partners on the internal SharePoint.

To ensure a high quality of the deliverables regular meetings to synchronise activities of the involved partners were held and the collected information was compiled by the responsible partner with the draft deliverables reviewed according to the established peer review process (see D1.1). For this purpose, online meetings were scheduled three to four weeks before the submission deadline with LEA partners and with the optional involvement of the advisors to present the key facts and content of the deliverable and gather feedback from practitioners. This feedback was reviewed and subsequently integrated into the deliverable. After the final internal check, quality control and formatting the deliverable was submitted on time in the portal. Any possible deviation from the due date stated in the DoA was promptly notified to the project officer with an appropriate justification for the extension of the deadline.

## 2.4  End user Management

The task T1.4 End user (LEAs) management was led by VESTA. VESTA has carried out the task to ensure a high involvement and satisfaction of end users throughout the whole project. This was achieved by conducting regular meetings, quality monitoring and collaborative events between VESTA, the end users and other partners. The SHOTPROS field trials in 2022 marked

the peak of the successful collaboration with the end users since they were conducted at their premises and set up according to their needs and strategic goals (see D7.1 and D7.2).

The SHOTPROS end users were involved in all project activities and provided their practical knowledge and experiences.

- Consortium and quarterly online meetings (see D1.1, D1.5 and D1.8)
- Research actives – planning, conduction and debriefing (see WP6 deliverables)
- Dissemination and communication activities (see D8.8 and D8.9)
- Field trials (see D7.1 and D7.2) – Preparation, conduction, de-briefing
- Technical development and validation of VR solution (see WP5 deliverables & End User feedback Weeks in D6.1)

In addition to the project's internal end users, an external advisory board guided SHOTPROS towards its ambition to develop tangible results that can be utilised by European law enforcement agencies. This was achieved by inviting the advisors (see D1.1) to key consortium meetings, studies (see D6.1), the field trials (see D7.1 and D7.2) and the final conference (see D8.11). Besides their general role as reviewers of deliverables, SHOTPROS advisors also played an important role at the implementation of D8.5, the policy maker toolkit, as the advisors provided their experience with VR introduction to this deliverable. Furthermore, the other external end user contacts that were established during the course of the project were invited to join the VR Police Network (see D8.9) and attend the final conference (see D8.11) to get informed about the results and provide their feedback.

# 3 Project Progress Report (M19-M42)

The project progress of the second 24 months of SHOTPROS is presented in this chapter from two different perspectives with a special theme as annex: the first sub-chapter outlines the progress towards the objectives as identified and described in the DoA and the second sub-chapter 3.2 indicates the progress per WP and tasks.

## 3.1 Progress towards Objectives

The following chapter aims to provide an overview of the collaborative efforts towards achieving the defined objectives of the project. Furthermore, in the vast majority of the deliverables submitted in the second reporting period the relation to the SHOTPROS objectives has clearly been illustrated in a separate section, in particular in all WP7 deliverables incorporating the final evaluated results and recommendations.

### 3.1.1 Objective 1: Evaluated and validate Human Factors Model for DMA under Stress and in High-Risk situations (DMA-SR Model)

As part of task 3.2, VUA developed a conceptual model of decision-making and acting in stressful, high-risk situations. The conceptual model is based on the notion that personal, contextual, organisational and societal human factors influence the perception of the demands of a situation, the perception of the abilities to cope with the demands and the appraisal of discrepancies between demands and abilities, which together determine the stress level of police officers. It is emphasised that the combination of stress and mental effort determines the consequences of stress for attention. A final core tenet of the conceptual model is that decision-making and acting, as the endpoint of attentional processes, should be viewed as actions resulting from motor heuristics and embodied choices. The conceptual model developed informs VR training in the sense that it identifies both the technical and content requirements for effective training of police officers' decision-making and action skills building the basis of the SHOTPROS training framework and the SHOTPROS Virtual Reality (VR) solution.

The model has been further validated in the second period during the field trials. For this purpose, VUA conducted seven focus groups with police officers and trainers and selected three core tenets of the HF model for DMA-SR and its implications. Further validation was obtained through semi-structured qualitative interviews conducted by the UHEI.

A full description of the conceptual Human-Factors DMA-SR Model can be found in D3.2 and the final validated results are presented as SHOTPROS Final Evidence-based HF Model for DMA-SR in D7.4. For easier understanding within the LEA partners and the interested external LEAs, the model was also issued as a factsheet one pager to provide the scientific basis of the project also to non-scientific partners.

Furthermore, the Belgian National Crisiscenter (ADCC-IBZ) and KU Leuven have developed an evidence-based risk assessment tool, which serves as a medium to convert the gathered data into practical applications, such as a (VR) training program for law enforcement agencies. The risk assessment tool will enable police trainers to control the difficulty of a law enforcement (VR) training by taking into account all factors that may influence the trainees' decision-making process and determining the exact stress level for the next training session and the accompanying scenario. Depending on the specific training objectives and the experience of the individual trainees, more stressors can be added to the training to increase the level of difficulty, or some can be omitted to achieve the opposite effect. The Risk Assessment Tool is based on an international scientific study on the perception of stress among active police officers during interventions that investigate stress factors during police interventions. Based

on scientific data from the HF studies in WP6 the tool was further tested and validated during the evaluation phase with the field trials in WP7 and the feedback from LEAs.

### 3.1.2 Objective 2: VR Environment that allows to manipulate HF in the Context of DMA-SR and observe related Behaviour

After the initial end user requirements workshops (see D2.2), the technical development proceeded as illustrated in D4.6. with the product backlog comprising all SHOTPROS VR solution requirements and thus directly contributing to objective 2. Some requirements were defined for conducting the HF studies, but most of the requirements were defined based on user needs and the goal of providing a usable solution at a high level of technological readiness (TRL 7-8). Then the stress cues (based on influencing factors) to influence the stress load for the trainees were defined and tested in different studies. The steering and manipulation of this stress exposure (Trainer Dashboard – see D4.5) of the trainees by the trainer is also part of the development and required for the HF studies. A series of training scenarios were defined in co-creation with the end user (focusing on training needs), the agile team (see D4.6) (focusing on feasibility, costs and timing) and the scientists (focusing on research needs) to be able to create a realistic VR DMA training for LEAs and a environment with valid data and evaluation options for the scientists with the final SHOTPROS VR training scenarios mainly targeting to objective 2 as without a scenario the environment cannot be used successfully.

### 3.1.3 Objective 3: (European Police) Training Framework and Curriculum for DMA-SR

In D3.3 – European Framework for Training and Assessment of Decision Making and Acting under Stress and in High-Risk Situations (DMA-SR) Behaviour of Professionals an extensive evidence-based set of recommendations for implementing VR DMA-SR training in current police curricula was provided. It is based on input and information about current training practices across European Law Enforcement Agencies (LEAs) (see D3.1), the design and illustrations of the conceptual human factors model of DMA-SR behaviour (see D3.2) and results from scientific Human Factor (HF) studies and experiments with European LEAs.

The initial recommendations and guidelines presented in D3.3 and were further evaluated through field trials with SHOTPROS LEAs (see D7.2). The results and implications were presented and elaborated in D7.5 - SHOTPROS Final Training Curriculum for DMA-SR. D7.5 comprises a training curriculum incorporating recommendations for implementing VR training in current police curricula and didactical guidelines for high-quality VR training. By this, D7.5 delivers also relevant input for the technical SHOTPROS VR solution (objective 2) and the

guidelines for VR training (objective 4) and the European VR police network (objective 5) in a LEA-centred form enhanced with quick to consume video descriptions per relevant criteria.

### 3.1.4  Objective 4 Guidelines for VR Training

Based on information from the end user workshops with all six LEA partners (see D2.2) and feedback from LEAs and technical requirements derived from various studies and end user feedback weeks (see D4.6), the guidelines for training scenarios (see D2.3) as well as the work by VUA on the HF model for DMA-SR (D7.4) and the SHOTPROS final training curriculum  (D7.5), the SHOTPROS final guidelines for VR training were elaborated and provided in D7.6.  It delivers an overview about training areas and the related usefulness of VR by describing considerations for the evaluation of VR systems in terms of technical requirements and explanations as well as a compilation of the LEA requirements for police training. D7.6 includes the evaluation and validation of the VR training solution in the field trials (FTs) with end users to generate the final results and impacts.

The D7.6 VR guidelines aim to make the knowledge gained on VR training available for building training systems with VR technologies and for future developments. To this end, it summarises all the knowledge on VR technology in the form of guidelines that can serve as a basis for the technological assessment of a VR training environment (objective 2) and integration of VR training technology into the existing training practices of European LEAs (objective 3). These guidelines, based on the results of the requirements analysis and evaluation with end users also contribute to the efforts of a harmonised and standardised VR training for police training which would also significantly enhance and strengthen the European police network (objective 5).

### 3.1.5  Objective 5: pan-European VR Police Network

The VR Police Network (VRPN) was established during the SHOTPROS to connect all stakeholders in the field of VR and police training and to provide a forum/platform for knowledge exchange. All contacts that were gathered during the project, were channeled in the network and invited to join as members. Although the VRPN was officially kicked off as planned during the SHOTOROS final conference (see D7.3), a soft opening of the network already started more than 1 year before this kick-off at a dissemination event in Vienna with the SHOTPROS advisor SIAK in August 2021. Another meeting with VRPN members took place 6 months later in Gimborn (see D8.9 – March 2022). By the end of October 2022, more than 80 official network members from 17 different European countries have subscribed.

The initial theoretical approach to develop a self-sustainable network was transformed to practice by hosting workshops, network meetings and the final conference in September 2022 as official kick-off event of the VRPN. VRPN will continue to collect, share and develop knowledge and experience as well as technical aspects and opportunities concerning VR and Police beyond SHOTPROS results (see D8.9 and D1.8 Annex)

## 3.2  Progress per WP

This chapter provides a brief overview of the project progress of the second period from month 19 to month 42 of SHOTPROS per work package. Each table indicates the submitted deliverables for this period, a summary of work performed per task with the main achievements, the follow-up on EC recommendations and (if applicable) the deviations from work plan. It must be noted that this report is complemented by the periodic technical and financial report that include a detailed description of the work performed, the involved partners and the resources spent (person months, costs incurred, explanation on resources as well as justifications to any reported deviations).

### 3.2.1  WP1

| WP-Nr. | WP1 | **Lead** | USE |
|---|---|---|---|
| **WP Title** | Project Management, M1-M42 | | |
| **Submitted Del.** | D1.1 Project Manual including Quality Assurance Guidelines (M23 – resubmission) | | |
| | D1.4 End User (LEAs) Management (M23 – resubmission) | | |
| | D1.7 Project Progress Report Period 2 (M42) | | |
| | D1.8 CM Meeting Minutes Report (M42) | | |
| | D1.9 1st Report on cumulative expenditure incurred (M32) | | |
| | D1.10 2nd Report on cumulative expenditure incurred (M42) | | |
| **Overview of work performed (per task)** | *T1.1: Project Coordination and Management (M1-42)*<br>• Preparation, organisation and conduction of 3 full consortium meetings (M19, M25 and M37)<br>• Production of consortium meeting minutes reports (see D1.8)<br>• Preparation and conduction of technical EC review meetings (M19 and M29) | | |

- Preparation and conduction of Steering Committee meetings on a half-yearly basis
- Preparation, organisation and conduction of 7 online conferences (M21, M22, M28, M31, M35, M40, M42)
- Set up and maintenance of an agile project management tool and enhancement of project manual (see D1.1)
- Monitoring and collection 3-monthly technical progress and efforts reports and 6-monthly technical progress and financial reports
- Communication with and project updates to EC project officer
- Scheduling and coordination of review meeting dates (mid-term and final EC review)
- Handling of project extension request, amendment preparation, AMD letter (1$^{st}$ amendment)
- Coordination of amendment procedure requested by the EC (2$^{nd}$ amendment with addition of D1.9 and D1.10)
- Handling of administrative and financial issues, processing of EC interim payment and transfer to partners
- Deliverables management including peer review process, quality assurance, handling of extensions and timely submission
- Risk assessment and monitoring on a quarterly basis and setting of precautionary and corrective actions
- Invitation of End User Advisory Board to CM Meetings, ensure involvement and collection of feedback
- Internal communication, supporting partners and giving advice with regard to financial matters

T1.2: Internal legal and ethical compliance check (M1-42)

- Update and specification of ethical guidelines and procedures (see D7.6)
- Update and addition of data privacy information and declaration of consent
- Monitoring project activities for compliance with ethical guidelines

*T1.3: Data Management Plan (M1-6)*

- Update of data management plan in the course of the conduction of the HF studies (see D6.1) and field trials (see D7.2)

*T1.4: End user (LEAs) management (M1-42)*

- High involvement of end users in the technological development of the SHOTPROS VR solution – refinement of requirements (see D2.2) in the weekly technical development meetings
- Continuous quality monitoring and intervention if a decreasing satisfaction of the end users was detected

| | |
|---|---|
| | • Field trials conducted at 5 end user premises (see D7.2) and close collaboration in planning and set-up<br>  ○ Preparation: several meetings with hosting end users to plan details, focus and aim of the field trial (see D7.1)<br>  ○ Conduction: according to the pre-defined plans to fulfil the strategic goals (as defined in D7.2) with the chosen VR scenarios (see D5.3 and D7.7) and media coverage (see D8.9)<br>  ○ Debriefing: debriefing meetings were conducted after each field trial to monitor end user satisfaction and gather learnings for the upcoming field trials (see D7.3)<br>• Research agenda (see D6.1) developed in collaboration with end users and studies designed in a way that identified knowledge-gaps in terms of DMA-SR research and VR can be closed; results reported in respective deliverables (D7.2 – D7.7)<br>• Management documents with concise information about the project results and deliverables, enhanced by factsheets, check-lists and guidelines developed for the end users, policy- and decision-makers (see D8.5)<br>• Transparent (internal and external) communication of events, meetings and project accomplishments with focus on end user involvement (see D1.1)<br><br>*T1.5: Assessment and Reporting of Societal Impact (M1-42)*<br><br>• Results from the EU citizen survey were re-analysed and tangible recommendations for VR training were derived (see D7.6)<br>• Implications and guidelines for the (VR) training scenario development were developed (see D7.6) based on the expectations of the EU citizens report (see D1.6) |
| **Follow-up of EC review recommendations and comments** | *Revision of D1.1*<br><br>Addition of an enhanced agile project implementation including release and sprint plan and peer review process, adapted reporting procedures on the basis of a new project management tool<br><br>*Revision of D1.4*<br><br>• Goals and scope and the methodological approach of the SHOTPROS EUM were enhanced and a detailed explanation about the SHOTPROS end user database was provided<br><br>*Role of advisory board* |

| | Involvement of the advisors and the visibility of their concrete actions was increased (see section end user management and other indications in the progress report) |
|---|---|
| **Deviations from work plan** | Cancellation of planned on-site Consortium Meeting (CM) in Amsterdam in May 2021 and conduction of online CM instead due to COVID. Cancellation of planned on-site Consortium Meeting in Vienna in November 2021 due to COVID. As the technical EC review could take place with participants from all partner organisations on site in Amsterdam (as hybrid meeting) in the 2nd half of September 2021, the consortium meeting in Vienna was changed to a half-day online conference (instead of a full CM). |

## 3.2.2 WP2

| **WP-Nr.** | WP2 | **Lead** | KUL |
|---|---|---|---|
| **WP Title** | Requirements Analysis and User Research, M1-24 | | |
| **Submitted Del.** | D2.2 LEAs Point of View: Requirement Report, Stakeholder Map and Expectation Summary for DMA-SR Model and Training Framework and Curriculum (M23 - resubmission) <br><br> D2.4 EU Citizens Study Report on Perceived Behaviour of Police Officers and Impacts for the DMA Model & Training Framework (M24) | | |
| **Overview of work performed (per task)** | *T2.2: Conduct a large-scale study on the perceived behaviour of police officers of EU citizens (M12-22)* <br><br> • Developing the EU citizen survey (= survey 1) considering socio-demographics factors of participants, attitude towards police and own experiences with police and filming the videoclips (serving as 'vignettes' in the survey) <br> • Distributing, analysing and reporting the data from the EU citizen survey with 640 respondents. <br> • Developing survey 2: perceptions of citizens on stress and training in police <br> • Distributing, analysing and reporting the data from survey 2 on stress and training in police with 740 respondents <br> • Analysing and reporting of the results in D2.4 | | |
| **Achievements / results** | The current study has provided an innovative new perspective from the citizens' point of view, and new insights on the perceptions of citizens on how police officers experience and (should) deal with stress during police operations. This knowledge has been further integrated in the VR training curriculum (see D7.6) and in the training scenarios (see D7.7) | | |

and serve as input for police organisations and policy makers for future communication to the public about the police and its functioning.

A final innovative aspect of the studies is that it provides new insights in the attitudes of citizens concerning police training and the use of VR in police training. These results confirm SHOTPROS' vision that VR is particularly useful for police training, and most particularly for the training of unusual events and stress exposure.

Summary of results:

- The extensive user research with police personnel offered very important insights for the development of the VR training tool, its scenarios and stressors and the curriculum resulting in concrete recommendations in terms of scenario development and the VR training framework (see D7.6)
- It provided clearer perspective on stakeholder involvement: who should be involved at which stage
- The research with EU citizens offered interesting insights in their relationship with and attitudes towards police and how they assess police DMA, which can be particularly useful for policy-makers and police organisations
- Data provided innovative new insights about attitudes of citizens towards the way police deal (or should) deal with stress during operational activities and about opinions on the use of VR in police training.

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| **Follow-up of EC review recommendations and comments** | *Revision of D2.2*<br><br>- Additional chapters were included in the deliverable, describing the recommendations made based on the user research and the next steps within SHOTPROS<br>- Tables were added in the VR requirements section indicating the number of times the specific requirements were mentioned in the workshops<br>- More information was given on how the findings from D2.2 will have an impact on further work, tasks and deliverables in SHOTPROS.<br><br>*Addition to D2.4 and reference to future deliverable*<br><br>- An analysis, conclusions and exploitable recommendations to the EU citizen study were added in D7.6 (see d7.6, chapter 6.3) |
| **Deviations from work plan** | none |

### 3.2.3 WP3

| WP-Nr. | WP3 | Lead | VUA |
|---|---|---|---|
| WP Title | Training Concepts & New Innovation Approach | | |
| Submitted Del. | D3.1 Overview of Current Training and Best Practices of Training Curricula in European LEAs and Impacts on the DMA-SR Modell and Training (M21 - resubmission)<br><br>D3.2 Conceptual Model of DMA-SR Behaviour and a Research Agenda to validate the Conceptual Model (M21 - resubmission)<br><br>D3.3 European Framework for Training and Assessment (using VR) of DMA-SR Behaviour of Professionals (including Training Concepts, Training Methods, Training Modules, and Assessment Methods) (M28) | | |
| Overview of work performed (per task) | • Analysis Site Visits and Training Observation for VR Training Framework (D3.3): The systematic training observations at the locations of the LEAs were assessed and evaluated. The interviews from the site visits have been transcribed, coded and analysed. Final results have been integrated into the VR training framework (D3.3).<br>• Conducting TrainCompar study (HFW1 - also part of WP6): Over the course of 2 weeks, 45 police students participated in the study and completed VR and real-life training sessions. Researchers from VUA observed and tracked the time the students spent during various training activities. Students wore heart-belt sensors and filled in experience questionnaires. Instructors filled in questionnaires and participated in interviews.<br>• Analysis TrainCompar study: Initial results were obtained from the systematic observation, the questionnaires filled in by instructors and trainees as well as the interviews with the instructors. The results have been integrated into the VR training framework (D3.3). Further results will be incorporated into a manuscript for publication.<br>• Preparation and finalisation of D3.3 which includes considerations for policy-makers, training coordinators and trainers. | | |
| Achievements / results | During the experiments conducted within WP3, information has been gathered on the heart rate and movement data during VR training, the influence of different VR After-Action-Review features on the quality of learning, and the impact of a pain stimulus on perceived mental effort and stress during VR training. These results will feed into the VR systems and its usability as a training tool within police organisations. | | |

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| | Through evidence-based results of experiments conducted within WP3, practically relevant information to stakeholders (policy-makers, academy management, training coordinators, instructors) regarding the use and implementation of VR training were provided.<br><br>Particularly, D3.3 offers practical toolkits such as VR implementation recommendations and a checklist for policy-makers and training coordinators, and didactical training guidelines for instructors that guide LEA professionals in the use of VR. All findings will be used to enhance the requirements towards a VR solution and feeding directly into the tasks of WP5, which have been validated within the field trials (WP7) and summarised into a final training curriculum and framework (see D7.5) and training guidelines (see D7.6). |
| **Follow-up of EC review recommendations and comments** | *Revision of D3.1*<br><br>• Training recommendations to improve the current state of police training based on the identified best training practices as well as recommendations for VR development with reference to best current police training practices were included.<br><br>*Revision of D3.2*<br><br>• A more concrete explanation of the HF model, conclusions and requirements for VR-training exploitable by LEAs and developers and a clear research agenda were included.<br><br>*Addition to D3.3 and reference to future deliverable*<br><br>• recommendations for implementation of VR into existing training structures of European LEAs and the didactical guidelines were further elaborated and the results are presented in D7.5 and D7.6. |
| **Deviations from work plan** | none |

## 3.2.4  WP4

| WP-Nr. | WP4 | **Lead** | AIT |
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| **WP Title** | Training Experience Assessment, Modelling and Scenario Development | | |
| **Submitted Del.** | D4.1 Cue Repository for Personalization and Customization of VR Training Scenarios (M21 - resubmission) | | |

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| | D4.4 Training Experience Framework and Structural Equation Model (M20) |
| | D4.5 Real-Time Training Progress Assessment Tool (M28) |
| | D4.6 Create Technical Requirements for VR Training Scenarios (M31) |
| **Overview of work performed (per task)** | *T4.3 Training Experience Framework and Models (M8-20)*<br><br>• Finalization of D4.4 Training Experience Framework and Structural Equation Model<br><br>*T4.4 Real-time measurement of training progress and decision-making performance (M10-28)*<br><br>• Conduct LEA feedback meetings to present dashboard concepts for live stress level visualisation, live intervention and after-action review.<br>• Analysis of physiological measurements (HR, BR, HRV)<br>• Model development for stress score computation and classification<br>• Definition of baseline measurement procedure<br>• Co-creation session for training KPIs in Selm with police trainers, reporting in D4.5<br>• Preparation and finalisation of D4.5<br>• Cortisol and alpha-amylase measures completed (Berlin study)<br>• Script for team movement analysis completed (Selm study)<br><br>*T4.5 Definition of technical requirements for the implementation of highly immersive VR training scenarios (M23-30)*<br><br>• NPC description in current system, concept for groups of NPCs<br>• Role player control concept using a game controller<br>• Inclusion of performance measure (KPI) definition in the requirements<br>• Continuous refinement of the requirements with the feedback from the studies and end user feedback weeks (see D6.1)<br>• Preparation of D4.6 draft document filling with technical requirements for training scenarios (tactical belt, stress measurement, stress cue control, AAR, role play, NPC concept, additional interface for manual control of NPC by operator/trainer).<br>• Alignment of D4.6 and backlog, integration of backlog entries, counting and removing duplicates and clustering of requirements from backlog<br>• Review and finalisation of D4.6 and alignment with other related documents |

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|  | *T4.6 Development of a risk assessment toolkit to identify high-risk situations (M8-24)* <br><br> • Conduction of an international study on the perceived impact of stressors on police officers during interventions. The study started off with a bottom-up approach, by including the stress cues that were reported by participating law enforcement agencies (LEAs) during previous workshops (see D2.2). In total, 515 participants from 16 countries took part in this study. <br> • Data analysis and elaboration of a risk assessment manual |
| **Achievements / results** | • Final design of the Risk Assessment Tool (as supplement to D4.7) <br> • List of stress cues prioritized by the LEA partners <br> • Dashboard design for Real-Time Training Progress Assessment Tool with stress assessment, stress cue control and training KPIs <br> • Stress score computation model and classification scheme <br> • Finalisation of technical requirements for VR Training covering a systematic description of requirements towards a scientifically evaluated and user feedbacked VR police training solution with the focus on scenario-based training for decision-making and acting (D4.6) |
| **Follow-up of EC review recommendations and comments** | *Revision of D4.1* <br><br> • Re-analysing SHOT-COVID data to identify pandemic-specific stressors that can be integrated in police training <br> • Stress cue list sent out for prioritisations to the LEA partners <br> • Feedback and priorities merged, and final stress cue list transferred in the backlog <br> • Definition of the wording scenario, stress cue, vignette and stressor |
| **Deviations from work plan** | none |

## 3.2.5 WP5

| **WP-Nr.** | WP5 | **Lead** | RL |
|---|---|---|---|
| **WP Title** | Contextual VR Simulator-Toolkit | | |
| **Submitted Del.** | D5.1 VR System Design Document for development of SHOTPROS VR Environment for conducting the Human Factor Studies and the Field Trials (M33) | | |

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| | D5.2 Agile Development of VR Test Scenarios & Environment and Preparation & Provisioning of Infrastructure for conducting the Human Factor Studies (M32) |
| | D5.3 Created VR Scenarios for DMA-SR Training for Evaluation and Field Trials (M34) |
| | D5.4 VR Results Dashboard for Reviewing and Measuring Training Sessions Performance and Output for Evaluation and Field Trials (M33) |
| **Overview of work performed (per task)** | *T5.1 VR System Design for Human Factors Studies based on identified LEA Requirements and Research Needs and for the Field Tests (M8-41)*<br><br>• Updates to the design document, processing of requirements based on backlog D4.6 and LEA sessions (end user feedback weeks according to the agile cycle defined in D1.1<br>• Adapting designs based on other WP inputs (model, movement, KPIs, visualization, triggers etc.)<br><br>*T5.2 Development VR Test-Scenarios, VR Live Editor and Sensorics Integration for Human Factors Measurement (M8-33)*<br><br>• Test scenario development and sensorics integration<br>• Prototyping live stress dashboard visualisation trainer dashboard<br>• Work on NPC behaviour and improving behaviour control<br>• Worked on shock belt / scent integration for additional sensors<br>• Added physical flashlight to tactical belt<br>• Added extra scenario assets: more broken assets like tv´s, vases, glasses, plates and shells for enhanced realism<br><br>*T5.3 VR Police Scenario Creation for Field Tests and Component Integration (M24-33)*<br><br>• Working on low-level integration of Medtronic Zephyr sensors and HP Omnicept integration<br>• Designing, implementing and adapting new scenarios (D7.7)<br>• Scenario script: Working on NPC behaviour, for example a behaviour tree (algorithm) to let the NPC´s show certain behaviour depending on actions<br>• Virtual environment: Improvement on realism with outdoor environment and audio, more details, European characteristics to reach a realistic as possible surrounding (stress generating realism)<br>• Work on VR controllers: possible to use just HMD and controllers to virtually move in an environment without physically moving<br>• Technical improvements on VR multiplayer and improved loading of scenarios |

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|  | • Physical interaction with objects in the environment, grabbing, pushing and throwing<br><br>*T5.4 VR Results Dashboard for Training Evaluation (M22-33)*<br><br>• Prototyping bio-feedback in After Action Review station<br>• UI implementation on Spectator/AAR and Excon<br>• Designing, developing, implementing and testing dashboards<br>• Measuring signals using Zephyr™ Bioharness™<br>• Real-time coupling between Zephyr sensors and the smartvests<br>• Development of Stress Control Panel: UI mock-ups and UI implementation on Excon<br>• Designed AAR format that is interpretable outside SUIT and consist of well-known file formats and prototyped AAR Dollhouse view<br><br>*T5.5 Provide the necessary VR infrastructure and environment (M10-33)*<br><br>• Provision of VR infrastructure and environment for HF studies, field trials and final conference in alignment with scientific and LEA partners<br>• Provision of 8 smart vests including rifles to support the team size of LEAs (4 additionally produced) and to execute realistic training flows (dress/undress in parallel, additional role players and trainers etc.)<br>• Battery management station and positioning system (also for realistic training execution on high TRL)<br>• New VR headset integration<br>• Haptic feedback for trainees<br>• Sensorics and electroshock integration<br>• Other tactical belt tool electronics (pepper, etc.)<br>• Virtual guns (e.g. Green Gun V2) |
| **Achievements / results** | • System design document with technical requirements and use cases based on previous work packages and LEA input; how does the VR environment operate for HF studies and field trials<br>• Illustration of the development process of the test scenarios, the way the scenarios can be manipulated during training, and in particular the role of sensorics measuring physiological response<br>• Development of the results and stress dashboard; performance and achievements of the trainees, visualised by re-playing the scenario, showing stress levels during different tasks and events during the scenario<br>• Development of 11 SHOTPROS VR solution scenarios and 4 additional scenarios within experimental VR setup (see D7.7) |

- o Development of SHOTPROS VR solution (Product 1) DMA-SR Training
- o Tactical Belt
- o Multisensory (scent, pain, senses)
- o Full body sensing
- o Free movement up to 70m x 100m
- o Trainer dashboard + all stress related features
- o Detailed AAR incl. KPIs
- Development of Experimental VR Setup (Product 2)
  - o A design has been made into blocks that can be ported to the Unreal system
  - o A planning has been made to evolve parts of the Capybara Engine to the new system
  - o A compact experimental system based on (as much as possible) COTS hardware running on Unreal
  - o Realism in graphics, characters and environmental/physics-based sound
  - o Vegetation, urban clutter and weather effects (water puddles on the street)
  - o Day/dusk/night
  - o A living environment with walking characters, driving cars even stopping for pedestrians on the zebra
  - o Multi-player to support the LEA, their buddy and an opponent.
  - o Accurate aiming and 0 calibration
  - o A basic exercise control (EXCON) user interface
  - o Basic stressor control (escalation/de-escalation)
  - o An adaptation of the tactical belt specifically for the experimental system
  - o A more intuitive way of operating after action reviews using a maquette view

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| **Follow-up of EC review recommendations and comments** | RL was provided with additional funds for the development and implementation of high stress scenarios and to further elaborate and refine the VR environment and solution for this purpose. High stress scenarios with amok-like scenery were developed based on end user needs and feedback (see D5.3 and D7.7 ie. "shooting incident at furniture shop with large crowd" for Berlin FT, day/night scenarios with experimental environment) and immersion raising factors were included. The result is an innovative SHOTPROS VR solution with multiple functions tailored to the needs of the end users (see D1.8 Annex) |
| **Deviations from work plan** | none |

## 3.2.6 WP6

| WP-Nr. | WP6 | **Lead** | AIT |
|---|---|---|---|
| WP Title | Human Factor Studies & Experiments | | |
| Submitted Del. | D6.1 Human Factors Study Plan (M36 - resubmission) <br><br> D6.2 Human Factors Measurement Toolkit (M24) <br><br> D6.3 Human Factors Study Transcripts and Log Files (M30) <br><br> D6.4 Human Factor Impact Analysis and Machine Learning Models (M33) | | |
| Overview of work performed (per task) | *T6.1 Preparation and Development of measurement instruments and experimentation plan (M8-22)* <br><br> Preparation and development of measurement instruments and experimentation plan, specifically: <br><br> • Definition of experimentation plan and coordination with end user partners to define goal of the study, value for technical development, and logistics like location, date, and participants, considering COVID-19 restrictions (e.g. for travel, hygiene during experiments, and LEA participation) (part of D6.1 Human Factors study plan) <br> • Development of the Human Factors Measurement Toolkit (D6.2), consisting of <br>   o Collection of data sources and measurement instruments (hardware, software and tools, types of measurements, questionnaires) <br>   o Concept for data management for the HF studies in WP6, and <br>   o Data analysis methods and tools (physiological and statistical analysis) <br><br> *T6.2 Experiments and Studies Execution (M10-24)* <br><br> • Conduction of End User Feedback Week 1 with all end user organisations to collect feedback on scenario 1, the general VR system and to collect feedback and ideas on the dashboard concepts for live stress level visualisation, live intervention and after-action review. <br> • Preparations for ethical approval stress cue study (HFW2) and for dynamical real-time measures of stress and performance in VR (HFW3) | | |

- Preparation and execution and analysis of Stress Cue Study Berlin (HFW2)
- Conduction of End User Feedback Week 2 (in Berlin) to collect feedback on the general VR system, and feedback and ideas on the dashboard concepts for live stress level visualisation, live intervention and after-action review.
- HFW3 & EUWF3: RealTime Stress and Performance and End User Feedback Week (in Selm)
  - o Study planning, setup and execution
  - o Data acquisition using questionnaires, physiological measurements and movement data.
  - o Co-creation feedback from LEAs on performance measure KPIs
  - o Partners and invited network members tested the updated VR scenarios and feedback was collected on user experience, training options and performance measurements
- ZueriVR2 study  - testing different bio data hardware
  - o Study design, preparation and execution.
  - o Data acquisition using questionnaires and physiological measurements.
- D6.3 preparation and finalisation
- Preparation and conduction of Gender Workshop (M33) and analysis and integration of results in D4.6


*T6.3 Quantitative Analysis of the impact of (simulated) human influence factors on user behaviour, decision-making and user experience (M10-30)*

- Data sets from studies are analysed with statistical methods in order to identify the relationships between stress cues and their wanted impact on human behaviour.
- Theoretical concept for the utilization of the risk assessment tool as a basis for an online machine learning models that predicts scenario stress levels and thereby enables trainer assistance (for scenario control) and further on the semi-automated stress management of scenarios by the ML model.
- Further development of concept of a ML model for semi-automated stress management of scenarios.
- Presentation of studies executed at the review meetings.
- Preparation and finalisation of D6.4 presenting the aim of stress cue management in training using machine learning, the stress management model description as well as future ideas and use cases

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| **Achievements / results** | • Assessment of the stress cues on their ability to induce stress<br>• Usability and applicability of the Zephyr BioHarness 3 bio module<br>• General feedback on the SHOTPROS VR system and ideas on the dashboard concepts for live stress level visualisation, live intervention and after-action review<br>• A first fully conducted field study on VR implementation in the training context to assess similarities between coaches' performance ratings and physical performance variables, stress-responses to different loads and psycho-physiological stress indicators during training<br>• Description of a machine learning based concept for stress prediction that can be further extended for scenario control. The concept provides an overview of data sources and how they can be used for ML and highlights future possibilities based on the developments of SHOTPROS VR training system, i.e. stress dashboard, improved stress assessment, stress prediction and scenario control |
| **Follow-up of EC review recommendations and comments** | *Revision of D6.1*<br><br>• An adapted template for user requirements collection was added in the Annex of the deliverable which shows the scale "importance", the "type of feedback", the "qualification and skills of the users" and a more elaborated description. |
| **Deviations from work plan** | none |

## 3.2.7  WP7

| WP-Nr. | WP7 | **Lead** | VESTA |
|---|---|---|---|
| **WP Title** | Evaluation Phase with Field-Trials and Generation of Final Results & Impacts (M25-42) | | |
| **Submitted Del.** | D7.1 Field Trial Methodology and Planning (M34)<br><br>D7.2 Field Trial Combined Analysis Report (M38)<br><br>D7.3 Report on the SHOTPROS Demonstration at the Final Conference (M41)<br><br>D7.4 SHOTPROS Final Evidence-based HF Model for DMA-SR (M41)<br><br>D7.5 SHOTPROS Final Training Curriculum for DMA-SR (M41)<br><br>D7.6 SHOTPROS Final Guidelines for VR Training (M41) | | |

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| | D7.7 SHOTPROS Final Evaluated VR Training Scenarios (M41) |
| **Overview of work performed (per task)** | **T7.1 SHOTPROS Field-Trial Methodology, Planning and Setup (M28-M34)**<br><br>• Preparation of a plan with technical requirements, organisational timelines and locations (see D7.1)<br>• Definition and selection of the 6 locations for the field trials at 5 different LEA partner organisations, which is Seibersdorf (SIAK, advisor), Bucharest (RMIA-DGL), Amsterdam (NPN), Selm (NRW), Berlin (BP), followed by the final FT at the final conference in Ranst (VESTA).<br>• A list of requirements and preparations, including information sheets, was drawn up for each FT and a detailed timetable was developed for the recruitment of participants to focus on the project objectives.<br>• Definition and specification of the research methods used and planning of data collection with the scientific partners for the evaluation, validation and improvement of the VR training solution<br>• Definition of the slots for the FTs with the option for fixed and flexible training sessions<br>• Definition of roles during the FTs<br>• Definition of the technological environment and preparation of the VR training scenarios for FTs<br><br>**T7.2 SHOTPROS Field Trial Conduction, Analysis and Reporting (M33-M38)**<br><br>• Setup of a general kick-off meeting for the FTs and preparatory meetings for each individual FT as well as debriefing meetings after the FTs as preparation input for upcoming the FT<br>• Conduction of 5 large scale FTs with LEA project partners following an agile structure regarding organisation, setup and execution<br>• Elaboration and compilation of the reports for each of the 5 FTs with the focus showcasing & training at Seibersdorf and Bucharest and experienced training at Amsterdam, Selm and Berlin (for details see overview in D7.2)<br>• Evaluation of the usability of the developed systems and technology acceptance and investigating the main factors contributing to the acceptance of the systems by LEAs through questionnaires completed by participants and trainers.<br>• Conduction of attention and memory tests on stress including saliva samples<br>• Validation on the training framework and curriculum with focus groups and training observation |

- Compilation of reports from LEAs and the technological partner to the FTs

T7.3 SHOTPROS demonstration at the final conference (M34-M41)

- Preparation of the agenda for the programme and the invitation list of potential attendees and follow-up confirmation of the participants.
- Conduction of periodical preparatory meetings of the organisational team on the content and progress of the conference planning (VESTA, KUL, USE and NCCN)
- Preparing the list of speakers, obtaining confirmations, regular agenda update and finalisation of the conference program by M40
- Budget preparation and allocation among the organising partners
- Planning and development of conference promotional and dissemination materials
- Scenario definition for showcasing and VR demo and finetuning with technical partner
- Setting up of the training environment with VR try-out options for participants of both the full-body suit solution as well as the experimental solution and an observation room for VR training
- Planning and conduction of a pre-event on 13 September 2022 with the execution of the final field trial of the project with the Belgian police
- Organising a press event for media and VIPs like the Belgian Minister of Internal Affairs
- Conduct the main conference as a two-day event (14 and 15 September 2022) with LEA representatives, security policy makers and participants from research and technology from 17 European countries.
- Preparation of a questionnaire for the experience with the VR demo and analysis of the feedback
- Development of an online evaluation form for the conference attendees, evaluation and summary of the results and collection of formalised feedback
- Follow-up of the event and compilation of the results of the final conference, documentation and finalisation of D7.3

T7.4 Final results, Conclusion and Recommendations (M28-M41)

- Further investigation of the HF model for DMA-SR (described in D3.2) to deliver input for VR development and training and test the

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| | effectiveness of the proposed implications of the model for VR training. |
| | • In collaboration with the LEA partners key messages were identified which are essential in developing a VR solution to train police officers in their DMA-SR performance (see D7.4) |
| | • Specification by the VR technology partner how the key messages are incorporated into the current system and identification of remaining features |
| | • Validation of the model through focus groups and semi-structured qualitative interviews |
| | • Incorporation of the findings into the model, final validation and compilation of the strengths of the model's implications for VR training. |
| | • Development of a comprehensive evidence-based set of recommendations for implementing VR DMA-SR training in current police curricula with information on the training areas, format, safety measures, logistics and tasks of the trainer in VR |
| | • Seven didactic concepts for high-quality training were described with an explanation how these didactic concepts can be applied in VR training (see D7.5) |
| | • Production of information videos for each didactical concept |
| | • Development of technical guidelines for law enforcement agencies (LEAs) involved in the implementation of VR training for DMA-SR with an illustration of hardware and software requirements and considerations for training facilities, resources, training set-up and preparation (see D7.6). |
| | • Evaluation and compilation of the results of the user experience studies and end user feedback weeks, the stressor materialisation studies and the EU citizen study for the definition of the final guidelines |
| | • Delivery of an overview of the components of VR training systems and their variations with focus on LEA specific considerations required for scenario-based training, potential challenges and current technical limitations. |
| | • Development of a guide for the successful design of scenarios for DMA-SR police training with guidelines and a template for the definition of scenario requirements for a scenario designer (see D7.7) |
| | • Provision of a checklist on successful DMA-SR scenarios for VR |
| | • Project a future outlook on scenarios and environment development with focus on technology and LEA practise |
| **Achievements / results** | • All 5 planned FTs were successfully implemented |

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| | • During the FTs, 24 training days were executed, with in total 54 trainings. A total of 191 trainees participated, guided by 25 trainers using 11 different scenarios.<br>• Over 130 people participated in the interactive workshops of the final conference and followed presentations by more than 25 speakers<br>• 66 people tried out the SHOTPROS VR solution and the experimental environment of the project in person as part of the SHOTPROS technology results presentation at the final conference<br>• For further achievements in WP7 see the presentation of final results, conclusion and recommendations listed above in T7.4 |
| **Deviations from work plan** | none |

## 3.2.8 WP8

| WP-Nr. | WP8 | **Lead** | USE |
|---|---|---|---|
| **WP Title** | Dissemination, Exploitation & Communication | | |
| **Submitted Del.** | D8.4 Dissemination Material V2 (M41)<br><br>D8.5 Strategies & Toolkit for Policy-Makers (M42)<br><br>D8.6 Dissemination Material V1 (M4)<br><br>D8.7 Exploitation Plan, Innovation Management and Business Outlook (M42)<br><br>D8.9 Reports on Dissemination Activities including 'VR Police Training Network' Report V2 (M42)<br><br>D8.10 VR Police Training Network for LEAs: Mission Statement and Implementation Plan (M23)<br><br>D8.11 SHOTPROS Final Conference Proceedings (M41) | | |
| **Overview of work performed (per task) and achievements** | **Note**: A more detailed description of the progress of WP8 can be found in D8.9 – Dissemination Report V2 which has been submitted with this D1.7 in M42<br><br>*T8.1 Dissemination Plan and Communication Guideline (M1-M35)*<br><br>• Target audiences identified, dissemination and communication strategies developed, communication guide was set up<br>• Visual identity & style guide (e.g. logo, colours, fonts, visuals) developed | | |

- All dissemination and communication activities in the project were carried out according to the overall strategy and guided by WP8-lead USE (see D8.8 and D8.9)

*T8.2 Media & Events (M1-M35)*

- Project website was set up and maintained by USE; inputs and feedback are provided by all partners, re-design of the website in Y2
- Social Media Channels (Facebook, LinkedIn, Twitter, ResearchGate) were set up and are updated regularly; Youtube channel was set up in Y3 to communicate project videos and clips in an appropriate manner to a broader audience (see D8.9)
- 5 press releases were sent to the media and over 23 European media published an article
- The project was presented at 44 national and international events and several high-level meetings
- 6 newsletters about the project progress were sent out to a total number of 87 subscribers
- A webinar series about 5 VR police topics was hosted by SHOTPROS to inform contacts about the project topics

*T8.3 Printed Materials for Policy-Makers and End Users (M10-M42)*

- 5 sets of printed materials were developed and distributed with the focus target audience of policy-makers and end users (see D8.9 and D8.4)
- The content was derived from the project and study results and the design was done according to the visual identity (see D8.1)
- Those materials were distributed by all partners to relevant target groups according to the overall dissemination strategy (see D8.1) at events, conferences, field trials and during workshops as reported in D8.9.

*T8.4 Strategies and Toolkit for Policy-Makers (M15-M42)*

- The draft policy-maker toolkit (see D1.6) was further elaborated and validated by the end users and resulted in the final policy-maker toolkit (see D8.5)
- The consortium got in contact with policy-makers on more than 19 occasions and convinced them of the added value of VR training for the police
- Furthermore, the end users used the events hosted by SHOTPROS (end user feedback weeks and HF studies – see D6.1 and field trials – see D7.1-D7.2) to invite national policy-makers and spread the word about the project and the importance of the results

*T8.5 Scientific Dissemination (M1-M42)*

- publications in peer-reviewed books / journals and participation at scientific conferences carried out by the research partners (see D8.9)
- several master theses were published about the project and PHD students got the opportunity to contribute to the project

*T8.6 Exploitation, Innovation Management and Business Outlook (M1-M42)*

- Several exploitation workshops were conducted to refine and to update the initially stated exploitation goals of the partners
- Bi-lateral IPR agreements were discussed and definitions planned
- Key exploitable results were identified and discussed with the partners
- Continuous monitoring of project outcomes and their exploitation potential will be carried out by all partners
- The final exploitation plan and business outlook was written and submitted as deliverable (see D8.6 – public parts and annex of D1.8 for the full confidential report)

*T8.7 Reach-Out to other End User Partners (Showcases) (M28-M42)*

- A demonstration tool was developed (see D8.7) to showcase the SHOTPROS project and its innovative approach for DMA-SR VR training to a broader target audience with focus on end users
- The demonstration tool presented at the events, meetings and workshops as reported in D8.9 according to the dissemination strategy (see D8.1)

*T8.8 Establish a "VR Training Network" for LEAs and Synergies with related Projects (M1-M42)*

- Contact and synergies with over 24 related European projects; further collaborations and exchange about common topics
- The VR Police Network was developed according to the plan (see D8.10) and officially kicked-off at the final conference (see D8.11)
- Several networking events were hosted by SHOTPROS and lead to a high engagement of network members
- More than 80 official network members joined the VR Policy Network by the end of the project
- The self-sustainable network will be utilised to disseminate the project results after the end of SHOTPROS and to foster European collaboration on VR policy topics

*T8.9 Conference for Showcasing and (external) Evaluation of the Training Framework (M34-M41)*

|  | |
|---|---|
|  | <ul><li>The final conference was planned and then conducted at VESTA in September 2022 (see D8.11 and D7.3)</li><li>More than 130 participants attended the conference, got informed about the project and its results (see D8.9)</li><li>Interested participants got the opportunity to test the SHOTPROS VR solution in parallel (see D8.9)</li><li>Great media coverage with 5 TV channels and several newspapers reporting on the conference</li><li>VIP demo and press conference with high-level guests was hosted by the consortium 1 day prior the conference</li></ul> |
| **Follow-up of EC review recommendations and comments** | *Launch of the creation of the network and sustained actions to liase with important actors/networks*<br><br>See D8.9 and the activities undertaken for this purpose in T8.8 and section 3.1.5. Objective 5. |
| **Deviations from work plan** | none |

### 3.2.9 WP9

| **WP-Nr.** | WP9 | **Lead** | USE |
|---|---|---|---|
| **WP Title** | Ethics requirements | | |
| **Submitted Del.** | D9.1 – D9-10 (M1-6) | | |
| **Overview of work performed (per task)** | All deliverables were duly submitted in RP1 and the outlined ethical requirements and guiding principles have continued to be addressed and adhered to in the second period. | | |
| **Deviations from work plan** | none | | |

# 4 Societal Impact Report

This section comprises the assessment of the societal impact of SHOTPROS in the second reporting period (M18 -M42) as described in T1.5 – Assessment and Reporting of Societal Impact.

## 4.1 Expected Societal Impact

SHOTPROS and its results has an impact on several societal aspects and levels. The identified aspects and how SHOTPROS contributes to them is described in the bullet points below:

- **A safer Europe through better training of police officers:** SHOTPROS enables police officers to better train their decision-making and acting skills under stress and in high-risk situations and consequently prevents and fights crime and terrorism more effectively. The high acceptance rate of the VR solution (see D7.6) indicates that this type of training has the capability to better prepare European police officers for their daily duties.

- **Stronger security structures:** The final results of the project (see D7.4 – D7.7) contribute to standardised tactical training for European police forces and the established network (see D8.10 and D8.9) which enables better exchange, harmonization and cooperation in law enforcement on EU-level and therefore strengthen the security structures within the EU Security Union.

- **Higher trust in European police forces and a higher level of perceived security through better trained police:** The innovative VR enhanced DMA-SR police training results in more appropriate handling of incidents (in terms of safety, legitimacy, proportionality and professionality) and safer public spaces. This contributes to a better image of law enforcement agencies, a higher overall perception that the European Union is a place of freedom, justice and security. By including ethical aspects (see D8.5) in the training, the project contributes to a better image of police training perceived by European citizens in general.

- **More cost-efficient training:** A direct economic benefit will result from the fact that VR training allows cost-efficient adaptation to different contexts, scenarios, new challenges and goals. The proposed training framework can be adapted to training for other professions that operate under stress and in high-risk situations (e.g. fire and rescue teams, disaster management and emergency services, the urgent medical intervention teams, specialised forces etc.) or other levels and roles within first responders' organizations (director of operations, crisis management, control room). By exploiting the project as outlined in D8.6, the economic benefits of the EU funded project can be relayed to the future customers of the project results.

- **Higher utilisation of available training time:** the fact that tactical training time for officers is rare, enhances the need for more efficient use of the limited available time. With a higher realism in training, a much better debriefing and a consequently higher learning effect, the available time is used more efficiently for trainees and trainer.

- **More evidence-based training**: The training curriculum (see D7.5) developed in SHOTPROS is based on empirical evidence and sound theoretical underpinnings, making

training more evidence-based and hence more effective in achieving maximal learning benefits. Furthermore, disseminating the practice of designing or choosing evidence-based trainings across law enforcement agencies across Europe with the support of the VR Police Network (see D8.9), will further lead to more effective training of law enforcement officers.

- **Relevant input for standardization of training and policies**: Due to the framework (Training curriculum D7.5) and the policy maker toolkit covering relevant information on VR training introduction to law enforcement, a first step for possible standardisation in Europe was achieved.

- **Positive Economic impact:** Actual and perceived public security and safety, especially safer public spaces, cities and streets will have a positive economic impact by raising the value as a business location, as a location for international organisations and for various economic sectors (e.g. tourism).

- **Relevance of stress as a factor in law enforcement training:** raising the awareness of the relevance to better train officers for stressful rea-life operations also establishes stress as a relevant factor in training. A better stress handling of officers prevents their load and reduces resulting disorders.

## 4.2  Societal Impact focus in SHOTPROS

### 4.2.1  EU citizen survey

Based on the large-scale study in WP2 on the perceived behaviour of police officers by EU citizens, the level of trust in police work, the perception citizens have about the police and certain police actions (and whether or not this is also dependent on citizens' personal characteristics), and subjective feelings of security were assessed. The results of this study (see D2.4) were transferred to draw recommendations for the SHOTPROS DMA-SR VR training and guidelines (see D7.6).

This includes several aspects (for a more detailed report, see D7.6):

- **Diversity in scenario development**: different surroundings, bystanders or victims (e.g. male or female), attitudes towards the police, etc.

- **Assessment of trainees' behaviours:** attention towards different environments or different persons should be given during the debriefing / after-action review

- **De-escalation techniques and verbal communication**: should be included in the VR training to meet the expectations of EU citizens

- **Perspective of police officers**: scenario-based VR training should be used to further educate citizens in why certain procedures are more optimal than others and to increase

their understanding in how (threatening) certain situations can be perceived by the police officers

## 4.2.2  Other research activities

SHOTPROS pays special attention on laying the basis for future evaluations of the effectiveness of its training framework. The methods and results of the studies conducted in WP6 and the validation during the field trials in WP7 were documented in a way that they can be replicated. The developed SHOTPROS VR solution includes tools to measure and track training progress and a results dashboard to evaluate the training success. This system is based on solid theoretical insights and empirically validated training content. Therefore, it allows for further research on the developed training and verification of the positive societal impact resulting from more effective law enforcement training, enhanced by VR.

## 4.2.3  Dissemination, Exploitation and Communication

WP8 – Dissemination, Exploitation & Communication contributes to the societal impact in many ways. The communication activities targeting the general public of EU citizens transferred the core message (as defined in D8.1), that the collaborative research and the outcomes of SHOTPROS result in direct benefits for the European society. On the other hand, the task T8.6 Exploitation, Innovation Management and Business Outlook ensures the uptake of the project results to maximise the (amongst others) positive societal impacts.

This goal is achieved by utilising the established VR Police Network, that takes initiatives and activities to gain and transfer knowledge in the topic of "VR & Police Training" for a sustainable, efficient and effective fight against crime and terrorism and therefore raises its societal impact. The aim of these activities is to use the multiplier effect to maximise the societal impact of SHOTPROS, to promote the exchange of ideas and experiences, and to spread innovations, knowledge and developments in the context of training in DMA and behavioral aspects of police work against terrorism and crime.